CONTENTS OF VOLUME 3

NUMBER 1

CHEMRAWN IV

Modern Chemistry and Chemical Technology Applied to the Ocean and its Resources

Proceedings of an International Conference and Workshop Sponsored by the International Union of Pure and Applied Chemistry, held at Keystone, Colorado, U.S.A., 4–9 October 1987

BRIAN HITCHON: Editorial 1

Articles

ALLEN BARD, EDWARD D. GOLDBERG and DEREK W. SPENCER: Modern chemistry and chemical technology applied to the ocean and its resources: Introduction 3

T. DAVID WAITE, DONALD T. SAWYER and OLIVER C. ZAFIRIOU: Panel 1: Oceanic reactive chemical transients 9

BRUCE O. HONEYMAN, ARTHUR W. ADAMSON and JAMES W. MURRAY: Panel 2: The nature of reactions on marine particle surfaces 19

ANDREW G. DICKSON, HAROLD L. FRIEDMAN and FRANK J. MILLERO: Panel 3: Chemical models of sea water systems 27

THOMAS E. GRAEDEL, PETER G. BREWER and F. SHERWOOD ROWLAND: Panel 4: Chemistry at the air–sea interface 37

WILLIAM R. MARTIN, STEVEN R. EMERSON and CHARLES LOCHMULLER: Panel 5: Chemical processes at the ocean bottom 49

Panel 1: Oceanic Reactive Chemical Transients—Unresolved Problems

NEIL V. BLOUGH: Upper ocean free radical chemistry 59

WERNER R. HAAG: Problem description in radical chemistries 60

MICHAEL R. HOFFMANN: Important unresolved problems in marine chemistry 61

JÜRG HOIGNÉ: Effect of abiotic photochemical processes on the chemistry of aquatic solutes and on global cycles 63

JAMES W. MOFFETT: Photochemistry and minor element transport processes 64

STEPHEN E. SCHWARTZ: Air–sea interface chemistry of reactive gases 65

T. DAVID WAITE: Kinetics of free radical processes in the marine environment 66

OLIVER C. ZAFIRIOU: Is there a measurable net marine photoreaction? 67

RICHARD G. ZEPP: Role of particles in natural water photochemistry 68

ROD. G. ZIKA: Chemical and physical characterization of chromophoric organic material 69

Panel 2: The Nature of Reactions on Marine Surfaces—Unresolved Problems
ROBERT ANDERSON: The nature of reactions on marine surfaces 73

MICHAEL P. BACON: Kinetics of chemical scavenging deduced from natural tracer distributions 74

KENNETH W. BRULAND: Trace element speciation: organometallic compounds and metal–organic ligand complexes 75

NICHOLAS S. FISHER: The nature of reactions on particle surfaces in seawater 76

BRUCE D. HONEYMAN: Particle–particle interactions: a new paradigm for aquatic chemists? 77

KEITH A. HUNTER: The nature and reactions of marine surfaces: unresolved problems 78

JAMES O. LECKIE: Adsorption and transformation of trace element species at sulfide/water interfaces 79

FRANCOIS M. M. MOREL: Solute–particle and particle–particle reaction in seawater 80

PETER H. SANTSCHI: A need to study interactive effects 81

WILLIAM G. SUNDA: Role of microorganisms in the association of trace elements with particles ... 82

Panel 3: Chemical Models of Sea Water Systems—Unresolved Problems
ROBERT H. BYRNE: Seawater trace metal speciation 85

WILLIAM CASEY: Non-linear irreversible thermodynamics and geochemical systems 86

CHEN-TUNG A. CHEN: Speciation and distribution of elements in seawater 87

ANDREW G. DICKSON: What do we need to know about kinetics in marine chemistry? 88

WILLIAM M. LANDING: Chemical kinetic/thermodynamic models for iron in the ocean 89

ANTONIO C. LASAGA: Geochemical cycles—kinetics 91

JOHN W. MORSE: Dynamics of chemical interactions 92

JOHN M. C. PLANE: Modeling photochemistry in the ocean 93

MICHAEL WHITFIELD: Modelling the dynamics of ocean systems 94

MICHAEL WHITFIELD and DAVID TURNER: Questions for the modelling group 95

Panel 4: Chemistry at the Air–Sea Interface—Unresolved Problems
WILLIAM E. ASHER: Air/sea interface chemistry and air/sea gas exchange 99

DAVID J. CARLSON: Unresolved questions concerning ocean–atmosphere interfaces 100

DAVID DYRSSEN: Problems in chemical oceanography and marine chemistry 101

DANIEL J. REPETA: Origin, composition and fate of dissolved organic carbon 102

ALAN T. STONE: Reaction kinetics and mechanisms in oceanography 103

RIK WANNINKHOF: Quantification of air–sea fluxes of gaseous compounds using deliberate tracers . 104

ANDREW J. WATSON: Coming to grips with the variability of surface water chemistry 105

Panel 5: Chemical Processes at the Ocean Bottom—Unresolved Problems
EDWARD BOYLE: Climate, ocean circulation, and the chemistry of benthic fossil shells 109

HENRY ELDERFIELD: On understanding sediment geochemistry 110

STEVEN R. EMERSON: Chemical reactions at the ocean bottom: problems and perspective 111

JOHN I. HEDGES: Key problems in the organic chemistry of marine waters and sediments..... 113

RICHARD JAHNKE: The role of minor element substitutions on marine mineral solubilities and formation and dissolution kinetics 114

KENNETH S. JOHNSON: The influence of the sediment community on chemical transformations..... 115

WILLIAM R. MARTIN: Whole-core squeezing: current work and future plans..... 116

FREDRICK G. PRAHL: Important future research for environmental organic chemistry..... 117

NIELS PETER REVSBECH: Chemical analysis near the sediment–water interface 118

KAREN L. VON DAMM: Hydrothermal seawater–basalt–sediment interaction chemistry 119

Acknowledgements..... 121

List of Participants 123

Agency Representatives 127

Subject Index 129

NUMBER 2

Articles

YOUSIF K. KHARAKA and DANIEL J. SPECHT: The solubility of noble gases in crude oil at 25–100°C 137

JAMES L. BISCHOFF, ROBERT J. ROSENBAUER, ANDRE TAVOSO and HENRY DE LUMLEY: A test of uranium-series dating of fossil tooth enamel: results from Tournal Cave, France 145

FUMITAKA YANAGISAWA and HITOSHI SAKAI: Leaching behaviour of a simulated nuclear waste glass in groundwater of 50–240°C..... 153

C. J. BARINAGA and S. O. FARWELL: Soil-sorbed, sulfur-containing gases: analytical methodology and preliminary application to geochemical petroleum prospecting 165

K. NOTSU, H. WAKITA and Y. NAKAMURA: Strontium isotopic composition of oil-field and gas-field waters, Japan 173

R. M. LOWRY, G. FAURE, D. I. MULLET and L. M. JONES: Interpretation of chemical and isotopic compositions of brines based on mixing and dilution, "Clinton" sandstones, eastern Ohio, U.S.A. 177

PEKKA A. NURMI, ILMO T. KUKKONEN and PERTTI W. LAHERMO: Geochemistry and origin of saline groundwaters in the Fennoscandian Shield 185

MICHAEL A. ANDERSON, PAUL M. BERTSCH and WILLIAM P. MILLER: The distribution of lithium in selected soils and surface waters of the southeastern U.S.A..... 205

S. P. VRIEND, P. F. M. VAN GAANS, J. MIDDELBURG and A. DE NIJS: The application of fuzzy *c*-means cluster analysis and non-linear mapping to geochemical datasets: examples from Portugal 213

GENE D. ROBINSON, KAREN HEALEY and VALERIE CARNEY KELLY: Use of tourmaline in stream sediments to detect submarine exhalative sulfide deposits: example from central Virginia, U.S.A. 225

Book Reviews

E. J. BROOKER: "Assay and Analytical Practice in the South African Mining Industry", by W. C. Lenahan and R. de L. Murray-Smith 231

S. J. HOFFMAN: "Practical Problems in Exploration Geochemistry", by A. A. Levinson, P. M. D. Bradshaw and I. Thomson 231

STEPHEN BOLIVAR: "The Geochemical Atlas of Northern Fennoscandia", Project Leader: G. Kautsky. Compiled by B. Bolviken and others 232

A. E. SOREGAROLI: "Writing Geochemical Reports, Guidelines for Surficial Geochemical Surveys", by S. J. Hoffman 232

Papers to appear in forthcoming issues 235

IAGC application form I

Papers published in *Organic Chemistry* III

NUMBER 3

Articles

MINORU KOIDE, VERN HODGE, EDWARD D. GOLDBERG and KATHE BERTINE: Gold in seawater: a conservative view 237

BRIAN L. GULSON, ROSS R. LARGE and PATRICIA M. PORRITT: Gold exploration using lead isotopes at Tennant Creek, Australia 243

JEFFREY C. CUTTELL, MIRO IVANOVICH, JOHN H. TELLAM and JOHN W. LLOYD: Uranium-series isotopes in the groundwater of the Permo-Triassic sandstone aquifer, Lower-Mersey Basin, U.K. 255

R. O. HALLBERG, P. ÖSTLUND and T. WADSTEN: Inferences from a corrosion study of a bronze cannon, applied to high level nuclear waste disposal 273

IVAN BARNES, W. C. EVANS and L. D. WHITE: The role of mantle CO_2 in volcanism 281

T. DEWERS and P. ORTOLEVA: The role of geochemical self-organization in the migration and trapping of hydrocarbons 287

A. NISHRI, H. J. HERBERT, N. JOCKWER and W. STICHLER: The geochemistry of brines and minerals from the Asse Salt Mine, Germany 317

ALAN T. HERLIHY, A. L. MILLS and J. S. HERMAN: Distribution of reduced inorganic sulfur compounds in lake sediments receiving acid mine drainage 333

S. KARLSSON, B. ALLARD and K. HÅKANSSON: Characterization of suspended solids in a stream receiving acid mine effluents, Bersbo, Sweden 345

Papers to appear in forthcoming issues 357

IAGC application form I

NUMBER 4

Victor Moritz Goldschmidt (1888–1947)

A commemorative volume on the centenary of his birth (compiled by A. A. Levinson)

BRIAN HITCHON: Editorial 359

PAUL ROSBAUD: Victor Moritz Goldschmidt (1888–1947) 361

C. E. TILLEY: Victor Moritz Goldschmidt (1888–1947) 371

O. HASSEL: Commemorative speech on Professor V. M. Goldschmidt at the Mathematics and Science Conference of 14 November 1947 379

BRIAN MASON: Reminiscences of Victor Moritz Goldschmidt 381

HANS E. SUESS: V. M. Goldschmidt and the origin of the elements 385

A. A. LEVINSON and C. B. SCLAR: Victor Moritz Goldschmidt (1888–1947): a pictorial tribute 393

W. P. SOMMERFELDT: Bibliography of Victor Moritz Goldschmidt 415

BRIAN HITCHON: V. M. Goldschmidt Conference 421

IAGC application form I

NUMBER 5

Articles

Z. P. WEI and I. LERCHE: Quantitative dynamic geology of the Pinedale anticline, Wyoming, U.S.A.: an application of a two dimensional simulation model 423

NOBUYORI TAKEDA and TADASHI ASAKAWA: Study of petroleum generation by pyrolysis—I. Pyrolysis experiments by Rock-Eval and assumption of molecular structural change of kerogen using ^{13}C-NMR 441

L. PAUL KNAUTH: Origin and mixing history of brines, Palo Duro Basin, Texas, U.S.A. 455

W. F. GIGGENBACH, A. A. MINISSALE and G. SCANDIFFIO: Isotopic and chemical assessment of geothermal potential of the Colli Albani area, Latium region, Italy 475

S. ILANI, E. ROSENTHAL, J. KRONFELD and A. FLEXER: Epigenetic dolomitization and iron mineralization along faults and their possible relation to the paleohydrology of southern Israel 487

J. K. BÖHLKE: Carbonate–sulfide equilibria and "stratabound" disseminated epigenetic gold mineralization: a proposal based on examples from Alleghany, California, U.S.A. 499

R. FUGE, M. J. ANDREWS, T. E. CLEVENGER, B. E. DAVIES, N. L. GALE, C. F. PAVELEY and B. G. WIXSON: The distribution of chlorine and iodine in soil in the vicinity of lead mining and smelting operations, Bixby area, S.E. Missouri, U.S.A. 517

ERNEST K. YANFUL, H. WAYNE NESBITT and ROBERT M. QUIGLEY: Heavy metal migration at a landfill site, Sarnia, Ontario, Canada—I. Thermodynamic assessment and chemical interpretations 523

ROBERT W. BUDDEMEIER and JAMES R. HUNT: Transport of colloidal contaminants in groundwater: radionuclide migration at the Nevada Test Site 535

JANE M. MATTY and MASON B. TOMSON: Effect of multiple precipitation inhibitors on calcium carbonate nucleation 549

Book Review
M. JOHN M. DUKE: "Geostandards Newsletter", edited by K. Govindaraju 557

Papers to appear in forthcoming issues 559

IAGC application form I

Papers published in *Organic Geochemistry* III

NUMBER 6

Articles

EDWARD D. GOLDBERG, MINORU KOIDE, KATHE BERTINE, VERN HODGE, MARTHA STALLARD, DARKO MARTINCIC, NEVENKA MIKAC, MARCO BRANICA and JAMAL K. ABAYCHI: Marine geochemistry—2: scavenging redux 561

MAHLON C. KENNICUTT, II and JAMES M. BROOKS: Relation between shallow sediment bitumens and deeper reservoired hydrocarbons, offshore Santa Maria basin, California, U.S.A. 573

JEREMY DAHL, ROLF HALLBERG and I. R. KAPLAN: The effects of radioactive decay of uranium on elemental and isotopic ratios of Alum Shale kerogen 583

P. C. SMALLEY, A. RÅHEIM, J. A. D. DICKSON and D. EMERY: $^{87}Sr/^{86}Sr$ in waters from the Lincolnshire Limestone aquifer, England, and the potential of natural strontium isotopes as a tracer for a secondary recovery seawater injection process in oilfields 591

DAVID A. GRISAFE, ERNEST E. ANGINO and STEPHEN M. SMITH: Leaching characteristics of a high-calcium fly ash as a function of pH: a potential source of selenium toxicity 601

J. RIDGWAY and P. N. DUNKLEY: Temporal variations in the trace element content of stream sediments: examples from Zimbabwe 609

ERNEST K. YANFUL, ROBERT M. QUIGLEY and H. WAYNE NESBITT: Heavy metal migration at a landfill site, Sarnia, Ontario, Canada—2: metal partitioning and geotechnical implications 623

ROBERT A. ZIELINSKI and ALLEN L. MEIER: The association of uranium with organic matter in Holocene peat: an experimental leaching study 631

M. IGGY LITAOR and E. M. THURMAN: Acid neutralizing processes in an alpine watershed front range, Colorado, U.S.A.—1: buffering capacity of dissolved organic carbon in soil solutions 645

D. J. HUNTLEY: The use of alpha counting for determining the heat production due to the uranium and thorium decay chains 653

Book Review
DONALD D. RUNNELS: "The Geochemical Atlas of the San José and Golfito Quadrangles, Costa Rica" 657

Papers to appear in forthcoming issues 659

Indexes to Volume 3 I

IAGC application form XXVII

Papers published in *Organic Geochemistry* XXIX

MAJOR CLASSIFICATION INDEX OF ARTICLES

ARCHAEOLOGICAL GEOCHEMISTRY

U-series dating of fossil tooth enamel, Tournal Cave, France 145-151

ENVIRONMENTAL GEOCHEMISTRY

Acid neutralizing processes in alpine watershed. I. DOC buffering 645-652
Chlorine and iodine in soils, Bixby area, Missouri, USA 517-521
Heavy metal migration at landfill site, Sarnia, Ontario, Canada 523-533, 623-629
Leaching of high-Ca fly ash: potential source of Se toxicity 601-608
Lithium in selected soils and surface waters, southeastern USA 205-212
Role of mantle CO_2 in volcanism 281-285

S compounds in lake sediments receiving acid mine drainage 333-344
Suspended solids in stream receiving acid mine effluents, Sweden 345-356

Radioactive Waste Disposal

Alpha counting to determine heat production from U and Th 653-656
Corrosion study of a bronze cannon 273-280
Geochemistry and origin of saline groundwaters, Fennoscandian Shield 185-203
Leaching behaviour of simulated nuclear waste glass 153-163
Radionuclide colloidal migration, Nevada Test Site 535-548

EXPLORATION: ENERGY RESOURCES

Petroleum and Natural Gas

Chemical and isotopic composition of brines, eastern Ohio, USA 177-184
Effects of U radioactive decay on Alum Shale kerogen 583-589
Quantitative dynamic geology, Pinedale anticline, Wyoming, USA 423-440
Shallow sediment bitumens and reservoired hydrocarbons, Santa Maria basin 573-582
Soil-sorbed S-gases in petroleum prospecting 165-172
Solubility of noble gases in crude oil at 25R to 100RC 137-144

$^{87}Sr/^{86}Sr$ in Lincolnshire Limestone aquifer: analog for secondary recovery tracer 591-600
Strontium isotopic composition of oil- and gas-field waters, Japan 173-176
Study of petroleum generation by pyrolysis - 1 441-453

Uranium

U and organic matter in Holocene peat: a leaching study 631-643

Hydrocarbons

Geochemical self-organization in migration and trapping of hydrocarbons 287-316

Geothermal Resources

Geothermal potential, Colli Albani, Latium region, Italy 475-486

EXPLORATION: MINERAL RESOURCES

Gold

Carbonate-sulfide equilibria and disseminated epigenetic Au mineralization 499-516
Gold exploration using Pb isotopes, Tennant Creek, Australia 243-254

Other Metallic Deposits

Epigenetic dolomitization and Fe mineralization, southern Israel 487-498
Fuzzy c-means cluster analysis and non-linear mapping 213-224
Temporal variations of trace elements in stream sediments, Zimbabwe 609-621
Tourmaline in stream sediments, central Virgignia, USA 225-230

HYDROGEOLOGY

Brines and minerals, Asse salt mine, W. Germany 317-332
Origin and mixing history of brines, Palo Duro Basin, Texas, USA 455-474
U-series isotopes in groundwater, Lower Mersey Basin, U.K. 255-271
INDUSTRIAL

Effect of multiple precipitation inhibitors on $CaCO_3$ nucleation 549-556

MARINE GEOCHEMISTRY

Gold in seawater: a conservative view 237-241
Marine geochemistry 2. scavenging redux 561-571

OTHER TOPICS

Editorial 1

CHEMRAWN

Adsorption and transformation of trace element species at sulfide/water interfaces 79
Air/sea interface chemistry and air/sea exchange 99
Air-sea interface chemistry of reactive gases 65
Chemical analysis near the sediment-water interface 118
Chemical and physical characterization of chromophoric organic material 69
Chemical kinetic/thermodynamic models for iron in the ocean 89-90
Chemical models of sea water systems 27-35
Chemical processes at the ocean bottom 49-55
Chemical reactions at the ocean bottom - problems and perspective 111-112
Chemistry at the air-sea interface 37-48
CHEMRAWN IV - Introduction 3-8
Climate, ocean circulation, and the chemistry of benthic fossil shells 109
Coming to grips with the variability of surface water chemistry 105
Dynamics of chemical interactions 92
Effect of abiotic photochemical processes on the chemistry of aquatic solutes and on global cycles 63
Geochemical cycles - kinetics 91
Hydrothermal seawater-basalt-sediment interaction chemistry 119
Important future research for environmental organic chemistry 117
Important unresolved problems in marine chemistry 61-62
Influence of the sediment community on chemical transformations 115
Is there a measurable net marine photoreaction? 67
Key problems in the organic chemistry of marine waters and sediments 113
Kinetics of chemical scavenging deduced from natural tracer distributions 74
Kinetics of free radical processes in the marine environment 66
Modelling the dynamics of ocean systems 94
Modelling photochemistry in the ocean 93
Nature and reactions of marine surfaces: unresolved problems 78
Nature of reactions on marine particle surfaces 19-26
Nature of reactions on marine surfaces 73
Nature of reactions on particle surfaces in seawater 76
Need to study interactive effects 81
Non-linear irreversible thermodynamics and geochemical systems 86
Oceanic reactive chemical transients 9-17
On understanding sediment geochemistry 110
Origin, composition, and fate of dissolved organic C 102
Particle-particle interactions: a new paradigm for aquatic chemists? 77
Photochemistry and minor element transport processes 64
Problem description in radical chemistries 60
Problems in chemical oceanography and marine chemistry 101
Quantification of air-sea fluxes of gaseous compounds using deliberate tracers 104
Questions for the modelling group 95-96
Reaction kinetics and mechanisms in oceanography 103
Role of microorganisms in the association of trace elements with particles 82
Role of minor element substitutions on marine mineral solubilities and formation and dissolution kinetics 114
Role of particles in natural water photochemistry 68
Seawater trace metal speciation 85
Solute-particle and particle-particle reaction in seawater 80
Speciation and distribution of elements in seawater 87
Trace element speciation: organometallic compounds and metal-organic ligand complexes 75
Unresolved questions concerning ocean-atmospheric interfaces 100
Upper ocean free radical chemistry 59
What do we need to know about kinetics in marine chemistry? 88
Whole core squeezing: current work and future plans 116

V.M. GOLDSCHMIDT

Bibliography 415-420
Conference 421
Editorial 359
Obituaries 361-369, 371-378, 379-380
Origin of the Elements 385-391
Pictorial tribute 393-414
Reminiscences 381-383

abiotic photochemical processes 63
absorption 24
acetyl acentonate 25
acid/base equilibria 60
acid deposition, soil buffering 645
acid mine drainage 333
acid mine waste 345
acid neutralization
    of alpine environment 645
ADP 62
Adriatic Sea 561
adsorption 19, 73, 74, 78, 79
    colloids 535
    equilibria 82
advection, reaction-driven 287
advective velocity, of clay pore waters 623
Africa, Zimbabwe 609
agriculture, statistical analysis 213
air-sea
    fluxes 99, 104
    gas exchange 99
    interface 100
    interface chemistry 37, 65, 99
air-water interfaces, ocean/atmosphere 103
Al 19, 29, 42
    in marine particulate matter 20
    in polluted stream sediments 345
Al hydroxides
    in polluted stream sediments 345
$Al(OH)_3$ 33

Alban Hills, Latium, Italy 475
aldehydes 9
Alleghany, California, USA 499
algal surfaces 16
alkalinity 47
alkyd sulfides 60
alkyl-substituted anilines 16
alloys, bronze 273
alpha counting 653
alpine tundra, acid neutralization 645
alpine wetland, acid neutralization 645
alteration, wall rock 499
Am, transuranic elements 24
amdesote 119
amino acids 20, 113
ammonia microelectrodes 118
amperometric electrodes 50
anaerobic metabolism 111
analcime 153

ANALYTICAL METHODS
    anodic stripping voltammetry 30, 31
        differential pulse 24
    antibody diagnostic techniques 15
    auger electron spectroscopy 23
    cathodic stripping voltammetry 30
    charge transfer amperometry 24
    chemiluminescent analysis 32
    continuous electrophoresis 52
    dialysis 21
    echelle spectrography coupled charge
        transfer device 54
    electrochemical methods 105
    electrodialysis 52
    electron nuclear double resonance 22, 23
    electron pulse radiolysis 13
    electron spin echo envelope modulation 22
    electron spin resonance 23
    electrophoresis 21
    electron paramagnetic resonance
        spectroscopy 10, 13, 22

ANALYTICAL METHODS
    extended x-ray absorption
        fine structure 22, 23
    field flow fractionation 52
    flash photolysis 13
    flow cytometry 80
    fluorescence 25, 102, 105
    fluorometric analyses 118
    Fourier transform infra red
        spectroscopy 22
    gel permeation chromatography 102
    high pressure dialysis 52
    high pressure liquid chromatography 54
    HRGC/FPD 225
    hydrazinolysis 52
    hydrophobic interaction chromatography 53
    infrared 30
    ion scattering spectroscopy 23
    isotachophoresis 52
    isotope ratio mass spectrometry 15
    laser acoustic spectroscopy 25
    laser doppler velocimetry 21
    laser photon correlation spectrometry 21
    liquid chromatography 51, 101
    MFC/FD/SSD 225
    mass spectrometry 30
    metal-specific chemiluminescence 30
    microcolorimetry 80, 118
    Mossbauer spectroscopy 22, 89
    nuclear magnetic resonance
        spectroscopy 10, 22, 30, 52
    nanosecond flash laser photolysis 32
    nebulizer technology
        inductively coupled plasma emission-
        mass spectrometry (ICP-MS) 54
    photo-acoustic spectroscopy 32
    photon correlation spectrometry 80
    picosecond laser flash photolysis 32
    pseudo-polarography 30
    pulse radiolysis 12, 13, 15
    resonance Raman spectroscopy 32
    secondary ion mass spectrometry 23
    sequential ultra filtration 21
    spectrophotometry 31
    sub-microsecond electron paramagnetic
        resonance 32
    surface-enhanced Raman spectroscopy 22
    time-resolved absorption spectroscopy 32
    time-resolved fluorescence techniques 10
    time resolved laser flash spectroscopy 13
    time resolved spectroscopy 12
    x-ray absorption fine structure
        analysis 89
    x-ray photoelectron spectroscopy 23
aniline 16
ankerite 487
    in Au ore bodies 487
anomaly, heat flow 119
anthropogenic, gases 99, 104
antigens 15
apatite 91
Ar 46
    in geothermal gases 475
    solubility in crude oil 137
aragonite 111
archaeology, corrosion of bronze cannon 273
aromatic amines 68
array detector 54
aryl ethers 60
As 73
    biomethylation 44
    from leached fly ash 601
    methylated form 75

AsO_4^{3-} 24

Asse Mine, West Germany 317
Atlantic Ocean 45, 109
  North 37, 42
atmospheric
  chemistry 37
  deposition 110
  NO_x 39

  oxidants 43
  photooxydants 63
ATP 62
Au
  exploration 499
  exploration using Pb isotopes 243
  in quartz veins 499
  in seawater 237
  and sulfidation 499
Au-quartz veins 499
Australia
  Tennant Creek, Northern Territory 243
authigenic
  mineral phases 114
  reactions 111
autooxidation
  products 14
  rate constants 60
autocatalysis 95

B, leaching behaviour 153
Ba, in marine particulate matter 20
bacteria 78, 81
bacterial clogging 623
bacterial sulfate reduction 333
Bahamas 47
Baltic Sea, Island of Öland 273
basalt 111
base metal sulfide ores 517
basin modelling 423
Benard
  cells 32
  convection 86
benthic fossil shells 109
Bermuda 38, 40
Bersbo, Östergötland, Sweden 345
bicarbonate microelectrodes 118
bimolecular porphyrin complexes 16
bioassays 25, 30
biodegradation 52
biogeochemical cycles 4
biological
  availability 95
  processes 94
biomarkers 52, 53, 113, 117
bischofite 317
bisnorhopane/hopane ratio
  in crude oil 573
bisulfide, trace metal complexes 28
bitumen
  destruction 583
  in shallow sediments 573
Bixby area, SE Missouri, USA 517
Black Sea 31, 73, 79
"black smoke" 50
bone, dating using U-series 145

Book Reviews
  Assay and Analytical Practice in the South African Mining Industry 231
  Practical Problems in Exploration Geochemistry 231
  The Geochemical Atlas of Northern Fennoscandia 232
  Geostandards Newsletter 557
  Writing Geochemical Reports, Guidelines for Surficial Geochemical Surveys 232
borohydrides 52
borosilicate 153
bottom water chemistry 109
boundary layer thickness 115
Br 3, 6, 19, 60
  in brines 455
  organobromides 44
Br^- 11, 13, 14, 15, 63

$BrCl^-$ 60
Brownian
  aggregation 22
  "pumping" 77
brine
  from Baltic Shield 185
  $CaCl_2$-rich 487

  Mg-rich 487
  oilfield 173, 177
  origin 317
  origin and mixing history 455
bronze, corrosion 273
Butler-Volmer equation 66
butyl-tin 75

C 19, 67, 81, 91, 583
  aliphatic 441
  aromatic 441
  cycle 5, 39, 51
  cycling 113
  dissolved organic 645
  isotopes in dissolved organic C 102
  isotopes in kerogen 583
  isotopes in saline groundwater 185
  net global gas flux 41
  in oceanic surface microlayer 43
  in soils 645
C-bond species 441

^{13}C-NMR analysis 441

^{14}C 44
C/N ratios, dissolved organic C 43, 102
C/P ratios, dissolved organic C 43
Ca 6, 19, 25
  in brines 177, 487
  from leached fly ash 601
  migration at landfill site 523
$CaCO_3$ 111

  dissolution rates 112
  solubility 31
calcite, solubility 29
calcium carbonate
  nucleation 549
  precipitation inhibitors 549
California, USA 42
  Elk Hills Oilfield 137
  Santa Maria Basin 573
California coast, USA 561
Canada
  Ontario
    Sarnia 523, 623
carbohydrates 113
carbon monoxide 45
carbonate 23, 91, 287
  mineral saturation 523
  phase diagram 499
  trace metal complexes 28

carbonate rocks, Fe mineralization 487
carbonate-sulfate equilibria 499
carbonato complexes 29
carbonyl
    compounds 13
    sulfide 9, 13, 39, 101
carnallite
    O and H isotopes 317
    source of brines 317
$CaSO_4$ 6

cation hydrolysis 85
CCl_4 39

Cd 19, 24
    anodic stripping voltammetry 30
    in benthic foraminifera 53
    in calcium carbonate shells 111
    from leached fly ash 601
    in marine environment 561
    in polluted stream sediments 345
Ce, in groundwater 535
CEPEX 81
cerrusite, below sanitary landfill 623
CH_3Cl 39

$(CH_3)_2S$ (dimethyl sulfide) 9

CH_4 5, 39, 111, 112
    in gases, Baltic Shield 185
charge transfer device detectors 51
chelated heavy metals 104
chemical
    data buoys 45
    field effect transistors 45
    gradients, in sediments 115
    kinetic models 31
    models 27, 89
    speciation 75
    technology 3
    tracers 101
chemically modified electrodes 50
chemiluminescent reactions 51
chemometric methods
    cluster analysis 53
    factor analysis 53
    linear discriminant analysis 53
chemosynthesis 119
CHEMRAWN 1
chlorite, at landfill site 523
chloro-complexes, of Au in seawater 237
chlorofluoromethanes 5
chlorophyll 9, 10, 43, 46
chromophores 10, 15, 59, 67, 93
chromophoric organic material 69
Cl 6, 19
    below sanitary landfill 623
    in brines 455, 487
    migration at landfill site 523
    net global gas flux 41
    in soils near Pb mines 517

^{36}Cl 116
Cl^- 13, 14
clay 91
    barrier 523
    Li content 205
    pore waters 623
clay barriers, heavy metal migration 523
clay minerals 68, 81
climate 109
Clinton sandstones 177
    cluster analysis 213
    Cm, transuranic elements 24
    Co 24, 82
        in groundwater 535
        in seawater 51

CO 13, 39
CO_2 5, 39, 40, 45, 47, 61, 99, 101, 105, 109
    cycles 38
    in geothermal gases 475
    in mantle xenoliths 281
    in volcanic eruptions 281
    mantle origin 281
    wall rock alteration 499
CO_2/HCO_3 system 99

$CO_3^{-\cdot}$ 11, 13

CO_3^{2-} 14

coagulation 77
coal, pyrolysis 441
Coastal Plain, USA 205
colloids 15, 21, 22, 30, 33, 52, 62, 77
    ferric iron 89
    transport 535
Colorado, Front Range, USA 645
competitive equilibration 25
composition, brine, chemical 177
computer code 29
constants, Henry's Law 137
contamination, at landfill site 523
convection 287
corrosion 273
corundum 22
COS (carbonyl sulfide) 9, 13, 39, 101
Cr 68, 73, 89
    from leached fly ash 601
crystal growth/dissolution 91
Cs
    in groundwater 535
    leaching behaviour 153
Cu 11, 16, 19, 24, 25, 30, 44, 82, 89
    anodic stripping voltammetry 30
    atmospheric 42
    as corrosion product 273
    in marine environment 561
    in marine particulate matter 20
    migration at landfill site 523
    organic complexes 75
    in polluted stream sediments 345
    below sanitary landfill 623
Cu(I) 11
Cu-catechol 25

Cu^+ 32
CuS (aq) 32
cuprite, as corrosion product 273

Dahlem Conference 7
data buoys 105
data sets, multivariate 213
data structure, statistical analysis 213
dating, U-series 145
DDT 7
deliberate tracers 104
Demerra Abyssal Plain 20
desorption 74
deuterium, in brines 177
diagenesis 79, 115, 591
    anaerobic 333
    S from acid mine pollution 333
diffusion 22
    equations 95
    at landfill site 523
    dilution, by surface water 177
    dimethyl sulfide 39, 44, 46, 99, 101
    dimethylsulfoxide 13
    disaggregation 77

dissolution 19
reactions 111
selective 623
dissolved organic C 9, 43, 102
dissolved organic matter (DOM) 7, 10, 11, 12, 13, 14, 16, 19, 24, 29, 42, 51, 60, 63, 89, 113
distribution coefficients
colloids 535
diurnal cycle 38
dolomite 487
in Au ore bodies 499
dravite, in stream sediments

East Hawaii Abyssal Plain 20
EDTA 25
Eh 73
at landfill site 523
Einstein, Albert
see V.M. Goldschmidt special issue (p. 396, 397)
El Nino-Southern Oscillation event 45
electrocatalysis 50
electrodes
gas-specific 118
ion 118
electron capture detection 104
electron donors 59
electrostatic interaction 24
element abundance
see V.M. Goldschmidt special issue (p. 385)
element speciation 87
Elk Hills Oilfield, California, USA 137
enamel, age dating 145
environment
statistical analysis 213
time/space phenomenon 5
environmental organic chemistry 117
enzyme 118
catalysis 73
inhibitors 15
enzyme-catalyzed reactions 52
epigenetic dolomitization
Fe mineralization 487
equilibrium models 27, 85
equilibrium thermodynamics 92
essential nutrients 24
ethyl-lead 75
Eu, in groundwater 535
Europe 185
exploration
Au 243
for crude oil 573
geochemical 225
exploration geochemistry
climatic influences 609
extraction
suspended metal forms 345
U from peat 631

fatty acids 20
polyunsaturated 10, 60
fatty alcohols 20
Fe 16, 19, 24, 29, 42, 45, 61, 78, 82, 89, 91, 103, 112
in acid mine drainage 333
complexation constants 89
in lake water 31
from leached fly ash 601

Fe
in marine particulate matter 20
migration at landfill site 523
mineralization in carbonate rocks 487
oxides 24
oxyhydroxide particles 89
in polluted stream sediments 345
below sanitary landfill 623
sulfide 79
Fe(II) 11
$Fe(OH)_3$ 33

Fe- oxides 16, 68, 82

Fe^{2+} 32, 60

Fe^{3+} 49
Fe/Mn oxides 609
Fenton type reactions 16
Ferrozine reagent 89
fertilizers, U remobilization 631
fiber optic, chemical sensors 45
Fick's law 32
field measurements 30, 32
filtration 31
Finland 185
Kerimäki 185
Liminka 185
Outokumpu 185
Parainen 185
first-order kinetics 88
flavin 9, 68
derivatives 10
fluid flow
in geothermal area 475
near nuclear detonation cavity 535
fluid inclusions 53
fluorophores 13, 15, 52
fly ash, type c 601
forest tundra
acid neutralization 645
formation water
noble gas solubility 137
Sr 591
Sr isotopes 591
fossil
elemental composition 53
fuel CO_2 39

isotopic composition 53
shells
chemistry 110
isotopes 110
Fourier's law 32
fractured media
near nuclear detonation cavity 535
France, Tournal 145
free radical 9
chemistry 59
processes, chemistry 66
reactions 64
Front Range, Colorado, USA 645
fulvic acids 6, 30, 95, 102
fuzzy c-means cluster analysis 213

gas exchange coefficient 40
gas phase reactions 94
gas-specific electrodes 118
gases 423
anthropogenic 104
atmospheric 65

gases
CH_4 185
H_2 185
N_2 185
reactive 65
S-containing in soil 225
trace 103
GC/MS 53, 54
Ge 75
biomethylation 44
methyl-Ge 75
gehlenite 601
gel permeation chromatography 102
geochemical cycles 91

GEOCHEMICAL EXPLORATION

for Au 243
geothermal 475
hydrocarbons 423
ironstones 243
soil-sorbed S-gases 225
stream sediment 225
submarine exhalative sulfides 225
using Pb isotopes 243

GEOCHRONOLOGY

radiocarbon age 43
r-measurements 102
U-series dating 145
geopolymers 52
geopressures
in hydrocarbon exploration 423
role of geochemical self-organication 287
Georgia, USA 205
geothermal
exploration 475
gradients, Ohio 177
geothermometer 117
Germany
see V.M. Goldschmidt special issue
Germany, West
Asse Mine 317
glacial cycles 111
glass 653
fiber optics 118
simulated nuclear waste 153
global change 3
global climate, history 53
goethite 22
gradient, geothermal 177
granite 153
Green River Basin, Wyoming, USA 423
groundwater
at landfill site 523
from nuclear detonation cavity 535
leaching experiment 153
saline, from Baltic Shield 185
U-series isotopes 255
Gulf of Mexico 41
Gulf Stream 46, 47

H
isotopes 6
isotopes in brines 177, 317
isotopes in saline groundwater 185
net global gas flux 41
H/C ratios, in kerogen 583

H_2 61
in gases, Baltic Shield 185
in geothermal gases 475
H_2O_2 11, 13, 15, 16, 32, 39, 60,63, 64, 66, 68

H_2S 9, 32, 44, 61, 73, 79, 112, 119

halite 53
dissolution by meteoric water 455
source of brines 317
halocarbons 39
halogen cycles 39

HCO_3^- 14

He
in geothermal gases 475
solubility in crude oil 137
health, human 205
heat flow anomaly 119
heat production 653
heavy metals, below sanitary landfill 623
hematite 16
Henry's Law, constants 137
heterogeneous chemistry 15
heterogeneous kinetics 31, 33
heterogeneous photoreactions 68
heterogeneous reactions 59
hexane-soluble lipids 20
Hg
biomethylation 44
methylated form 75
histidine 60
$HO^\bullet$ 11, 15
HO_2 13, 65

homogeneous kinetics 31
Honshu, northeastern, Japan 173
hot springs 119

HS^- 23

humic 63
acids 6, 30, 32, 92, 95, 102
materials 16, 24, 52
substances 10, 13, 33, 51, 52, 68, 101, 113
in soil buffering 645
humification 24
hydraulic conductivity
at sanitary landfill 623
hydraulic gradient
at landfill site 523
hydrocarbon evolution 423
hydrocarbon gases, generation 583
hydrocarbons 20
in seeps 573
role of geochemical self-organization 287
hydrogeochemistry
acid mine effluents 345
Baltic Shield groundwaters 185
hydrolysis 113
hydrophobic exclusion 24
hydroquinones 11
hydrothermal 153
activity 111
alteration 499
fluids 49, 50, 89
reactions 33
solutions 87
systems 50, 119
vents 7, 61
hydroxy carbonate complexes 29
hydroxy complexes 29
hyperbola, mixing 177

I 6, 14, 42, 73
in the atmosphere 45
cycle 9
in marine particulate matter 20
net global gas flux 41
in soils near Pb mines 517
I^- 63
$I^\bullet$ 14
IAGC 1
illite, at landfill site 523
inclusions, tenorite in bronze 273
inhibitors
in calcium carbonate precipitation 549
inhomogeneous light scattering 21
interfacial reactions 81

IO_3^- 42

ion
electrodes 118
exchange 30, 31, 89
at landfill site 523
-ligand interactions 92
pairing 27, 29, 92
pairs 87
ionic strength 24, 60, 87
ironstones 243
irreversible thermodynamics 32, 92
Island of Öland, Baltic Sea 273
isomorphic substitutions 114
isotope exchange
seawater and rocks 173
Isotopes

C
in methane 185
in Alum Shale 583
D
in brines 317
in carnallite hydration water 317
in kreserite hydration water 317
in polyhalite hydration water 317
dissolved organic C 43
geothermal waters 475
H
in saline groundwater 185
in brines 177
in H/C seeps 573
O
in saline groundwater 185
in brines 177, 455

^{18}O
in brines 317
in carnallite hydration water 317
in kreserite hydration water 317
in polyhalite hydration water 317
Pb 243
S
in saline groundwater 185
Sr 173, 177
in formation waters 591
in saline groundwater 185
Th-series 255
U-series 255
U-series dating, fossil tooth enamel 145

isotopic variation, (D, ^{18}O, ^{13}C) 475
Israel
Negev 487
northern Sinai 487
Italy, Latium, Alban Hills 475
IUPAC 1
Japan 441
northeastern Honshu 173

K 19
atmospheric 42
leaching behaviour 153
migration at landfill site 523
kainite, O and H isotopes 317
Kerimäki, Finland 185
kerogen 423
C isotopes 583
in Alum Shale 583
pyrolysis 441
structural change 441
ketones 10
kieserite, O and H isotopes 317
kinetics 74, 88, 91, 95
in calcium carbonate precipitation 549
models 89
U removal from peat 631
Kr, solubility in crude oil 137

La, in marine particulate matter 20
lability 23
Lake Anna, Virginia, USA 333
landfill site 523
leaching
fly ash 601
in geothermal area 475
of simulated nuclear waste glass 153
U from peat 631
Li
in brines 317
in hydrothermal vents 54
leaching behaviour 153
in rocks, fossils 53
in soils 205
in surface waters 205
Li/Na ratio, in hydrothermal vents 54
ligand-metal complexes 22
ligands 78, 85, 89
lignins 102, 113
Liminka, Finland 185
Linear Free Energy Relation 87, 95
linoleate 14, 15
lipid-linked polysaccharide compounds 53
lipids 113, 117
Lower Mersey Basin, United Kingdom 255
lumichrome 13

mackinawite 79
magnesite, in Au ore bodies 499
magnetite shales
as source of Pb isotopes 243
major reactive transients 12
malachite, as corrosion product 273
mammal bones, age dating 145
mantle, CO_2 in xenoliths 281

mapping, non-linear 213
marine particle surfaces 19
marine photoreactions 67
marine salts 6

marine sediments 110, 114
marine snow 23, 76, 81, 82
marine waters, organic chemistry 113
Maxwell-Boltzman distribution law 22
MERL 81
metals
    chelates 68
    complexation 28
    complexes 9
    coordination compound reactions 52
    humate complexes 30
    humic complexes 32
    ion adsorption 24
    organic ligand complexes 75
    sulfide minerals 111
    sulfides 79
metasomatism, and Au mineralization 499
meteoric water, mixing with brines 455
meteorites
    see V.M. Goldschmidt special issue (p. 385)
methane, outgassing of 287
methionine 101
methods,
    statistical 213
methyl halides 46
methyl-Ge 75
Mg 3, 6, 19
    atmospheric 42
    in brines 487
    migration at landfill site 523
$MgCl_2$ 6

microbes 115
microbial degradation 113
microbial reduction 561
microcolorometry 80, 118
microelectrodes 115, 118
    ammonia 118
    bicarbonate 118
    measurements 116
    nitrate 118
    sulfide 118
    technology 50
microorganisms 62, 82
mid-ocean ridge crests 33
migration, hydrocarbons 287
mineral
    deposits, submarine exhalative sulfide 225
    dissolution kinetics 114
    formation 114
    occurrence, statistical analysis 213
    solubilities 114
mineralization, base metal 517
mining, lead 517
Missouri, SE, Bixby area, USA 517
mixed layer models 93
mixed-ligand complexation 29
mixing
    binary 177
    regime 88
Mn 16, 19, 24, 61, 66, 82, 89, 103, 112
    acids 91
    in groundwater 535
    in marine environment 561
    in marine particulate matter 20
    oxides 16, 24, 68, 82
    in polluted stream sediments 345

Mn^{2+} 32

Mn^{4+} 49
Mn-Fe hydrous oxides
    in polluted stream sediments 345
Mn-Fe oxides
    in geochemical exploration 225

Mo 16, 24
    in marine environment 561
    leaching behaviour 153
mobility 345
    U in peat 631
models 95
    box 89
    chemical 89
    continuous advection/diffusion 89
    kinetic 89
    mixed layer 93
    ocean dynamics 94
    photochemistry 93
    physical adsorption 95
    thermodynamic 89
modelling
    hydrocarbon exploration 423
    mathematical 287
    saline groundwater 185
    U mobility in peat 631
MODIS 47
molecular structural change 441
molecular weight
    determinations 10
    of dissolved organic C 102
monoclonal antibodies 15
monolayer films 100
multivariate data sets 213

N 19
    cycle 5, 9, 39, 101
    isotopes 6
    net global gas flux 41
    organic 101
N_2
    in gases, Baltic Shield 185
    in geothermal gases 475
N_2O 5, 39

Na 6, 19
    below sanitary landfill 623
    from leached fly ash 601
    in brines 177
    leaching behaviour 153
    migration at landfill site 523
NaCl 3, 6
natural tracers 74
Nd, in rocks, fossils 53
Ne, solubility in crude oil 137
Nevada Test Site, Nevada, USA 535
Nevada, USA 535
Newton's law 32
NH_3, amines 39

Ni 24, 82
Nimbus 7 46
nitrate 45, 63
    microelectrodes 118
    photolysis 11
nitrite 63
nitrone "spin traps" 14
nitrous acid deamination 52
nitroxides 13
    as probe molecules 15
NO 11, 14, 60

NO_3 11, 46, 49, 60, 116

NO· 14

NO_2 65

NO_2^- 14, 60

NO_3 47

^{15}NO trapping 14
Nobel prizes
    see V.M. Goldschmidt special issue (p. 385)
noble gases, solubility in crude oil 137
non-linear irreversible thermodynamics 86
Northern Sinai, Negev, Israel 487
Norway
    see V.M. Goldschmidt special issue
Nubian sandstone aquifer 487
nuclear waste disposal
    inferences from corrosion study 273
nucleation rates 33
nutrient supply 38

O 91, 118
    cycle 5, 39
    isotopes 6
    isotopes in brines 177, 317
    isotopes in saline groundwater 185
    net global gas flux 41
    system 16
    transients 13

O_2^- 64
    radicals 32
O_2 9, 40, 44, 45, 46, 47, 49, 60, 64, 99, 105, 116
    cycles 38
    transients 13

$O_2^{-\bullet}$ 11, 13, 14, 15, 16

O_3 39, 65

$^1O_2$ 64

^{18}O 15
O/C ratios, in kerogen 583

ocean circulation 109
ocean palaeochemistry 110
ocean slicks 100
ocean water, variability 105
oceanic surface film 99
oceanic surface microlayer 42
$OH^\bullet$ 12, 14
Ohio, USA 177
oil 423
    solubility of noble gases 137
olivine
    see V.M. Goldschmidt special issue (p. 414)
Ontario, Sarnia, Canada 523, 623
opal 111
    in marine particulate matter 20
optical second harmonic generation 46
optrodes 50, 118
ore forming processes 111
ores, stratabound 499
organic acids
    at landfill site 523
    in soil buffering 645
organic C 20, 49, 111, 423
    in marine particulate matter 20
organic heterogeneous photoreactions 68
organic hydroperoxides 14
organic ligands 24
organic matter 20
    in Alum Shale 583
    association 623
    synthesis by organisms 117
organic polymers 68
organics, below sanitary landfill 623
organometallic compounds 75
origin, saline groundwater 185
Os 6
outliers, statistical 213
Outokumpu, Finland 185
oxidation-reduction reactions 115
oxide coatings, in geochemical exploration 225
oxygen minimum zone 89
ozone 9, 41, 45, 63, 93

P 19, 91

^{231}Pa, in fossil tooth enamel 145
Pacific Ocean 45, 63, 89, 237
    North 102
paleoclimatology 117
paleoenvironmental assessment 117
paleohydrology 487
Palo Duro Basin, Texas, USA 455
Panama Basin 20
Parainen, Finland 185
particle phase 94
particles
    surface reactions 76
    transport 42
particle-particle interactions 77, 80
particle/water interfaces
    ocean/atmospheric 103
particulate matter 20
partition coefficients, noble gases 137
partitioning, metals 623
pattern formation 86
Pb 24
    anodic stripping voltammetry 30
    below sanitary landfill 623
    from leached fly ash 601
    in polluted stream sediments 345
    in soils near Pb mines 517
    in stream sediments 609
    isotopes in Au exploration 243
    migration at landfill site 523

^{204}Pb, in Au exploration 243

^{208}Pb, in Au exploration 243

^{210}Pb 42
$PbCO_3$, solubility 31
Pd/H electrode 51
peat 631
    U-rich 631
peat-soils, overliming 631
pegmatite, schorl in stream sediments 225
perepoxide 60
periodate 52
permeases 24
Permo-Triassic sandstone aquifer 255
peroxides 9
peroxidized lipids 10
peroxyacetyl nitrate 39
peroxyradical 63
petroleum 173, 573
    generation curves 441
    solubility of noble gases 137
    surface exploration 225
    volcanic rock reservoir 173

pH 16, 24, 30, 46, 49, 50, 66, 112, 118
    at landfill site 523
    in acid mine waste 345
    of clay pore waters 623
    of fly ash leachate 601
    of soil solutions 645
phenolic groups 14
phosphate 45
    trace metal complexes 28
phosphorites 91, 111
photic zone 93
photobleaching 9
photochemical
    fluxes 67
    processes 9
    reactions 32
    reduction 561
photochemistry 64, 68, 69, 75, 113
    modelling 93
photolabile chelators 64
photolysis 113
photosynthesis 19, 38, 75, 119
physical adsorption models 95
phytodetritus 76
phytoplankton 81, 105
Piedmont, USA 205
Pinedale Anticline, Wyoming, USA 423
Pineview Field, Utah, USA 225
Pitzer's equations 27, 29
Po, in marine environment 561
PO_4 85

pollution 11, 623
    mine waste 345
    selenium 601
polychlorinated biphenyls 7
polyfunctional ligands 95
polyfunctional organic compounds 94
polyhalite, O and H isotopes 317
polymerization 22
polysulfides, trace metal complexes 28
polyunsaturated fatty acids 10, 60
pore water
    consituents 116
    gradients 116
porosity, enhancement of 287
porous fiber desalting 52
Portugal 213
precipitation 19
    inhibitors 549
pressure solution 287
pristane/phytane ratio, in crude oil 573
probe molecules 24
protactinium, in fossil tooth enamel 145
pseudo-colloids 21, 30, 33
pterins 10
Pu
    in marine environment 561
    transuranic elements 24
pulsed laser source 13
pyrite
    at landfill site 523
    in Au ore bodies 499
    in polluted lake sediments 333
pyrolysis
    coal 441
    kerogen 441
    shale 441

^{226}Ra 104
    in groundwater 255

^{228}Ra, in groundwater 255
radicals 11
    chemistry 60
    formation 59
radiocarbon
    age 43
    measurements 102
radiogenic isostopes 22
radioisotopes 15
radionuclide 6, 21, 103
    transport 535
rain, acidity 39
rare gases, solubility in crude oil 137
rate equations 95
reaction kinetics 103
reaction rates, in sediments 115
reaction stoichiometry 23
reactions on marine surfaces 78
reactive chemical transients 9, 15
    in fresh water 11
redox
    kinetics 91
    reactions 11
    states 73
relaxation kinetic techniques 22
reservoir, tracer technique 591
respiration 19
Rh 6
Rn 653
    flux 39
    release factor 255
    release mechanisms 255

^{222}Rn 39, 44, 104
    in groundwater 255
ROO 60
ROO• 11, 12, 14
ROOH 14
Ru, in groundwater 535
rutile 16

S 61, 91, 101
    cycle 5, 9, 39, 44
    gases in soils 225
    and gold mineralization 499
    isotopes 6
    isotopes in saline groundwater 185
    net global gas flux 41
    in polluted lake sediments 333
    reduced inorganic 333
salt formations 317
sandstone
    Clinton, Ohio, USA 177
    U-series isotopes 255
Santa Maria Basin, California, USA 573
Sarnia, Ontario, Canada 523, 623
satellite-mounted scattermometers 40
Sb 73
    in groundwater 535
    methylated form 75
Sc, biomethylation 44
scavenging 19, 24, 64, 77, 78, 113
    chemical 74
    metals 561
    studies 12
    trace metal 95
schorl, in stream sediments 225
Schrödinger's equation 32
Se 73, 82, 101
    biomethylation 44
    from leached fly ash 601
    methylated form 75

sea water
ancient composition 53
Au content 237
paleochemistry 53
sea water-basalt-sediment interaction 119
seals, diagenetic 287
sediment-water exchange 116
sediment-water interface 49, 115, 118
sedimentary rocks, concretions 86
sediments
chemical reactions 111
diagenesis 333
geochemistry 110
isotopes 110
lake 333
marine 109, 110
micromineralogy 110
ocean water reactions 49
organic chemistry 113
organic-rich 631
suspended 345
self organization 86
geochemical 287
semiquinones 11
shale
organic matter 583
pyrolysis 441
Si 19
leaching behaviour 153
siderite
at landfill site 523
in Au ore bodies 499
Sierra Nevada, California, USA 499
silica 601
amorphous 87
SiO_2 47, 49, 111, 112, 116

slow sorption kinetics 77
smelting, lead 517
smithsonite, below sanitary landfill 623
Sn 19
as corrosion product 273
methylated form 75

SO_4^{2-} 49, 61

SO_4 6, 19, 111
in acid mine drainage 333
reduction 91
Sohm Abyssal Plain 20
soil
exploration 517
interstitial water 645
Li content 205
S-gases 225
solid state electrochemical reactions 50
solubility
noble gases in petroleum 137
parameters 87
U in pore water 631
soluble carbonate
in marine particulate matter 20
solute-particle reactions 80
solvent extraction 31
sorption 255
South Carolina, USA 205
space-borne "chemical" sensors 46
speciation 92
specific adsorption 24
specific interaction theory 27
spectroscopic methods 29
spin traps 15
spread films 100
Sr
in brines 177
in formation water 591

Sr
isotopes 6, 591
isotopes in oil field water 173
isotopes in saline groundwater 185
in marine particulate matter 20
in rocks, fossils 53
$SrSO_4$, solubility 31

stability constants 28, 87

STATISTICS
chemometric methods
cluster analysis 53
factor analysis 53
linear discriminant analysis 53
statistical analysis
fuzzy c-means cluster 213
non-linear mapping 213
statistical methods 213
steranes
in crude oil 573
in shallow bitumens 573
steroid ketones 20
sterols 20
steryl esters 20
stream sediments, temporal variations 609
subaerial volcanism 110
sulfate, at landfill site 523
sulfidation, and Au mineralization 499
sulfide 23, 29
microelectrodes 118
trace metal complexes 28
sulfide/water interfaces 79
sulfone 60
sulfur hexafluoride 41, 104
superoxide 59
dismutase 60
surface acoustic wave devices 45
surface film, organic 561
surface layer 153
surfaces
activities 92
catalysis 73
chemical models 81
coordination chemistry 22
precipitation 19
surface-active compounds 99
survey, surface soil 225
Sweden 185, 583
Berbo, Östergötland 345
sylvite 317

Te, methylated form 75
tectonic lineaments
and Fe mineralization 487
teeth, age dating 145
Tennant Creek
Northern Territory, Australia 243
tenorite, as bronze alloy 273
termination product determinations 12
tetramethylethylene, as probe molecule 15
Texas, USA, Palo Duro Basin 455
Th 19, 22, 74, 653
isotopes 21
in mudstone 255

^{228}Th 74
in groundwater 255

^{230}Th 22, 74
in fossil tooth enamel 145
in groundwater 255

^{232}Th, in groundwater 255

^{234}Th 21, 74
Th-series radionuclides 255
thermal anomaly 475
thermal initiation processes 11
thermal processes 9
thermochemical data, noble gases 137
thermodynamic
    assessment 523
    binding constant 23
    carbonate solid solutions 499
    carbonate-sulfide equilibria 499
    constants 81
    data 85
    equilibrium 94, 95
    equilibrium models 30
    models 89
thiols 44
Th, in fossil tooth enamel 145
Ti 42
    in marine particulate matter 20
tourmaline, in stream sediments 225
Tournal, France 145
toxic metals, below sanitary landfill 623
toxicity, selenium 601
trace elements
    in polluted stream sediments 345
    in saline groundwater 185
    Se 601
    temporal variations 609
trace gases 103
trace metal speciation 9, 28, 85, 95
trace metals
    interactions 95
    scavenging 95
    in seawater 82
    speciation 75
trace technique 591
tracer gases 41
tracer spikes 115
transition metals 64
    migration at landfill site 523
triacylglycerols 20
triterpanes
    in crude oil 573
    in shallow bitumens 573
tritium 104
type c fly ash 601

U 23, 73, 653
    in Alum Shale 583
    in Au ores 243
    in fossil tooth enamel 145
    isotopes 21
    in marine environment 561
    in mudstone 255
    in peat 631

^{234}U, in groundwater 255

^{238}U, in groundwater 255
U-organic bonding 631
U-series
    dating fossil tooth enamel 145
    disequilibrium 255
    radionuclides 255
U-Th series isotopes 19
ultra-violet oxidation 31
ultracentrifugation 21
ultrafiltration 89, 102

United Kingdom
    Lincolnshire Limestone 591
    Lower Mersey Basin 255
USA
    California 42
        Santa Maria Basin 573
        Elk Hills Oilfield 137
        Alleghany 499
    California coast 561
    Coastal Plain 205
    Colorado, Front Range 645
    Georgia 205
    Green River shale 583
    Nevada, Nevada Test Site 535
    northeastern Washington 631
    Ohio 177
    Piedmont 205
    SE Missouri, Bixby area 517
    South Carolina 205
    Texas, Palo Duro Basin 455
    Utah, Pineview Field 225
    Virginia 225
    Virginia, Lake Anna 333
    Washington 631
    Wyoming, Green River Basin 441
    Wyoming, Pinedale Anticline 423
USSR 185
Utah, Pineview Field 225
UV 30

V 16
    atmospheric 42
    in marine particulate matter 20
Vernadsky, W.
    see V.M. Goldschmidt special issue (p. 406)
Virginia, USA 225
    Lake Anna 333
vitrinite reflectance
    in hydrocarbon exploration 423
volatile organic compounds 103
volcanic eruptions
    role of mantle CO_2 281

volcanic melts
    buoyancy due to CO_2 281

volcanism, subaerial 110

Washington, USA 631
    northeastern, USA 631
waste
    disposal 523
    domestic 623
    nuclear 153
    radioactive 273
water
    below sanitary landfill 623
    carbonate-rich 631
    formation 173, 177
    from nuclear detonation cavity 535
    gasfield 173
    geothermal, isotopes 475
    oilfield 173
    pollution 535, 601
    stream sediment 213
    surface 205
water-rock interaction 185
    in Permo-Triassic aquifer 255
water/sediment interface 113

wax eskers 20
whole-core squeezing 116
    techniques 49
WIFS 46
wind-wave tunnels 40
Wyoming, USA, Pinedale Anticline 423

Xe, solubility in crude oil 137
xenobiotics 9

Zimbabwe, Africa 609
Zn 19, 24, 82
    anodic stripping voltammetry 30
    atmospheric 42
    migration at landfill site 523
    organic complexes 75
    in polluted stream sediments 345
    below sanitary landfill 623
    in stream sediments 609
ZnO colloids 62
zooplankton 81

AUTHOR INDEX
(Book Review - BR)

Abaychi J.K. 561
Adamson A.W. 19
Allard B. 345
Anderson M.A. 205
Anderson R. 73
Andrews M.J. 517
Angino E.E. 601
Asakawa T. 441
Asher W.E. 99
Bacon M.P. 74
Bard A. 3
Barinaga C.J. 165
Barnes I. 281
Bertine K. 237, 561
Bertsch P.M. 205
Bischoff J.L. 145
Blough N.V. 59
Bohlke J.K. 499
Bolivar S. (BR) 232
Boyle E. 109
Branica M. 561
Brewer P.G. 37
Brooker E.J. (BR) 231
Brooks J.M. 573
Bruland K.W. 75
Buddemeier R.W. 535
Byrne R.H. 85
Carlson D.J. 100
Carney Kelly V. 225
Casey W. 86
Chen C.-T.A. 87
Clevenger T.E. 517
Cuttell J.C. 255
Dahl J. 583
Davies B.E. 517
de Lumley, H. 145
de Nijs A. 213
Dewers T. 287
Dickson A.G. 27, 88
Dickson J.A.D. 591
Duke M.J.M. (BR) 557
Dunkley P.N. 609
Dyrssen D. 101
Elderfield H. 110
Emerson S.R. 49, 111
Emery D. 591
Evans W.C. 281
Farwell S.O. 165
Faure G. 177
Fisher N.S. 76
Flexer A. 487
Friedman H.L. 27
Fuge R. 517
Gale N.L. 517
Giggenbach W.F. 475
Goldberg E.D. 3, 237, 561
Graedel T.E. 37
Grisafe D.A. 601
Gulson B.L. 243
Haag W.R. 60
Hakansson K. 345
Hallberg R.O. 273, 583
Hassel O. 379
Healey K. 225
Hedges J.I. 113
Herbert H.-J. 317
Herlihy A.T. 333
Herman J.S. 333
Hitchon B. 1, 359, 421
Hodge V. 237, 561
Hoffman S.J. (BR) 231
Hoffmann M.R. 61
Hoigne J. 63
Honeyman B.D. 19, 77
Hunt J.R. 535
Hunter K.A. 78
Huntley D.J. 653
Ilani S. 487
Ivanovich M. 255
Jahnke R. 114
Jockwer N. 317
Johnson K.S. 115
Jones L.M. 177
Kaplan I.R. 583
Karlsson S. 345
Kennicutt II M.C. 573
Kharaka Y.K. 137
Knauth L.P. 455
Koide M. 237, 561
Kronfeld J. 487
Kukkonen I.T. 185
Lahermo P.W. 185
Landing W.M. 89
Large R.R. 243
Lasaga A.C. 91
Leckie J.O. 79
Lerche I. 423
Levinson A.A. 393
Litaor M.I. 645
Lloyd J.W. 255
Lochmuller C. 49
Lowry R.M. 177
Martin W.R. 49, 116
Martincic D. 561
Mason B. 381
Matty J.M. 549
Meier A.L. 631
Middelburg J. 213
Mikac N. 561
Miller W.P. 205
Millero F.J. 27
Mills A.L. 333
Minissale A.A. 475
Moffett J.W. 64
Morel, F.M.M. 80
Morse J.W. 92
Mullet D.I. 177
Murray J.W. 19
Nakamura Y. 173
Nesbitt H.W. 523, 623
Nishri A. 317
Notsu K. 173
Nurmi P.A. 185
Ortoleva P. 287
Ostlund P. 273
Paveley C.F. 517
Plane J.M.C. 93
Porritt P.M. 243
Prahl F.G. 117
Quigley R.M. 523, 623
Raheim A. 591
Repeta D.J. 102
Revsbech N.P. 118
Ridgway J. 609
Robinson G.D. 225
Rosbaud P. 361
Rosenbauer R.J. 145
Rosenthal E. 487
Rowland F.S. 37
Runnells D.D. (BR) 657
Sakai H. 153
Santschi P. 81
Sawyer D.T. 9
Scandiffio G. 475
Schwartz S.E. 65
Sclar C.B. 393
Smalley P.C. 591
Smith S.M. 601
Sommerfeldt W.P. 415
Soregaroli A. (BR) 232
Specht D.J. 137
Spencer D.W. 3
Stallard M. 561
Stichler W. 317
Stone 103
Suess H.E. 385
Sunda W.G. 82
Takeda N. 441
Tavoso A. 145
Tellam J.H 255
Tilley C.E. 371
Thurman E.M. 645
Tomson M.B. 549
Turner D. 95
van Gaans, P.F.M. 213
von Damm K.L. 119
Vriend S.P. 213
Wadsten T. 273
Waite T.D. 9, 66
Wakita H. 173
Wanninkhof R. 104
Watson A.J. 105
Wei Z.P. 423
White L.D. 281
Whitfield 94, 95
Wixson B.G. 517
Yanagisawa F. 153
Yanful E.K. 523, 623
Zafiriou O.C. 9, 67
Zepp R.G. 68
Zielinski R.A. 631
Zika R.G. 69